

PATENT
10/080,216

Remarks

In view of the foregoing amendments and the following remarks, it is respectfully requested that this application be reconsidered.

As set forth above Claims 1, 6, 7, 19, 22, 34, 53 and 59 were amended and new claims 64 – 94 were added. Enclosed is the credit card payment form to cover the additional \$36 filing fee.

Please cancel claims 20, 21, 25-28, 30, 36, 37, 39, 40, 44-52, 56-58, and 60-62 without prejudice.

The Applicant appreciates that the Examiner has indicated that Claims 3-5, 16 and 17 would be allowable if rewritten in independent form to include all the limitations of the claims from which they depend. Also, the Applicant appreciates that the Examiner has indicated that Claims 6-15 would be allowable provided that line 2 of Claim 6 is rewritten, and that there is a proper antecedent basis for Claim 7, lines 5-6, "said at least one functional insert".

Claim 6 has been rewritten and amended in order to eliminate the confusion in line 2. In order to correct the antecedent basis of Claim 7, Applicant has amended claim 7 to depend from allowed Claim 5. Accordingly, claims 6-15 are allowable as ultimately being dependent from an allowed amended Claim 1 discussed below.

Claim 59 has been amended so as to be dependent from amended Claim 53 (see herein below) instead of being dependent from cancelled Claim 57 (see below).

New Claim 64 has been added and is equivalent to Claim 3 rewritten in independent form to include all the limitations of original unamended base Claim 1 from which Claim 3 was originally dependent. As indicated by the Examiner in his remarks cited above this amended claim is allowable.

Additionally, Applicant has entered new claims 65-94, which correspond respectively to Claims 2, 4, 5, 6 (as amended), 7 (as amended), 8-18, 19 (as amended), 22 (as amended), 23, 24, 29, 31, 32, 33, 34 (as amended), 35, 38, and 41-43. New claims 65-94 are all directly or indirectly dependent from allowable new Claim 64 and should therefore also be allowable.

PATENT
10/080,216

Claim 1 of the present invention, stands rejected as being anticipated by Coombe (US 4,502,641). Applicant has amended Claim 1 paragraph e) by the addition of the underlined phrase

“e) at least one feed inlet disposed in said end wall for introducing a substantially particulate solid material.....”

Coombe discloses solid feed details, with reference to Figures 1 and 2, and in the text, Column 3, line 65 to Column 4 line 1:

“A venturi feeding device 9 serves to introduce the solid material to be ground to the chamber, it being aligned somewhat tangentially to facilitate flow of the solids and fluid into the chamber vortex.”

Coombe further discloses in Claim 1, column 4, lines 61-62:

“.....means for charging pulverulent solids to the chamber at the peripheral wall...”

Coombe further stresses (column 2 line 34 to column 3 line 41) the need to introduce solids tangentially into the vortex thereby resulting in the conservation of vortex energy. Introducing the solids tangentially, in a manner to conserve the vortex energy and the pressure differential across the vortex, reduces or avoids any perturbations, which would otherwise reduce the vortex energy and pressure differential.

Coombe therefore restricts the solid feed to being generally tangentially introduced into the chamber through the peripheral side wall and not through the end wall. Specifically, solids are introduced at the peripheral side wall into the direction of rotation of the vortex flow.

Claim 1 of the present invention has been amended to provide for introducing the solid feed material solely through a feed inlet or an auxiliary feed inlet disposed in the end wall of the working chamber, in accordance with multiple references in the text of the present application. Such references include, but are not limited to, Page 19, lines 18-22, 27-28, referring to Figures 1-3, Page 21, lines 14-17 and Page 22 lines 15-21 referring to Figure 4 and Claim 22, paragraphs a)-d). Feeding solids through a solids inlet or an auxiliary solids inlet disposed in the end wall provides one of the means for controlled perturbations within the vortex chamber.

PATENT
10/080,216

Furthermore, the Examiner has indicated that Coombe "discloses a vortex mill including air inlets 3, which would result in the claimed perturbations." The air inlets as disclosed by Coombe in Claim 1, column 4 lines 57-61 are:

"....a multiplicity of inlets extending through the peripheral wall and aligned for directing gaseous fluid into the chamber tangentially to a circle whose radius is smaller than the radius R of the chamber...."

Similar reference is made in the Coombe text, Column 3, lines 56-62.

The Applicant respectfully maintains that these inlets, while causing a vortex flow in the chamber, do not include means for causing perturbations and, specifically, for causing controlled perturbations.

By contrast, the present invention provides devices and techniques for causing specific types of perturbations such that the nature and frequency of these perturbations are controllable. References in the present application made to apparatus for causing perturbations and means for control thereof, include, but are not limited to, Claims 1, 16, 17, 18, 19, and in the text related to Figures 3, 8, 10B, 11, 13, 16, 18 and 25.

In view of the aforementioned disposition of the solids feed inlet in the end wall of the milling chamber and the provision for controlled perturbations in the specification relating to the present invention, and the absence of these features in Coombe, the Applicant respectfully maintains that amended Claim 1 of the present invention is not anticipated by Coombe and is allowable.

Claim 19 has been amended by removal of the words "flat, planar." Applicant respectfully submits that there is no reference to a limitation of non-planar end walls in Coombe. Moreover, amended Claim 19 is dependent from allowable amended Claim 1 and therefore should also be allowable.

Claim 22 has been amended to remove reference to a feed inlet "..... e) disposed in said side wall." while retaining references to a feed inlet in the end wall. As Coombe does not teach or suggest a feed inlet in the end wall, Applicant respectfully believes that amended Claim 22 is not

PATENT
10/080,216

anticipated by Coombe and the claim is allowable. Moreover, Claim 22 is dependent from allowable amended Claim 1 and should therefore also be allowable.

Claim 24 discloses configurations and positions of the solids feed inlet, which are not disclosed or claimed in Coombe. Coombe further stresses (column 2 line 34 to column 3 line 41) the need to introduce solids tangentially into the vortex thereby resulting in the conservation of vortex energy. Introducing the solids tangentially in a manner to conserve the vortex energy and the pressure differential across the vortex reduces or avoids perturbations, which would otherwise reduce the vortex energy and pressure differential.

Coombe therefore restricts the solid feed to being generally tangentially introduced into the chamber through the peripheral side wall and not through the end wall. Specifically, solids are introduced at the peripheral side wall into the direction of rotation of the vortex flow.

Claim 24 further is dependent from allowable amended Claim 1 and, therefore, Applicant respectfully submits that Claim 24 is allowable.

Claim 53, as amended, includes a limitation as to feeding solids through a “....feed inlet disposed in the end wall” of the milling chamber and further relates to a step of “....inducing controlled perturbations in the vortex flow...”. These features are not disclosed in Coombe as discussed hereinabove in relation to amended Claim 1. Consequently, Applicant believes that claim 53 is not anticipated by Coombe and is therefore allowable.

Claim 55 relates to introducing working fluid into a chamber at a predetermined angle to the vortex flow so as to cause perturbations to the flow. The predetermined angle and the flow rate of working fluid are, amongst others, means for providing controlled perturbations within the vortex flow. This is illustrated in the text with reference to, but not limited to, Figures 3 and 13. Coombe discloses introducing working fluid tangentially to the vortex. Moreover, Claim 55 is dependent from allowable amended base Claim 53 and therefore Claim 55 should also be allowable.

The Examiner's rejection of claims 20, 25-27, 30, 57-58 and 60-61 are moot as these claims have been cancelled without prejudice.

PATENT
10/080,216

Claims 2, 18, 21, 28, 29, 40, 56 and 59 stand rejected as unpatentable over Coombe (US 4,502,641) on the grounds of being obvious to one of ordinary skill in the art.

Claim 2 discloses an outer casing “....configured to surround and enclose said at least one working chamber...”. The intended purpose of such an outer casing is to facilitate inserting multiple working chambers therein to provide varying degrees of comminution. Coombe neither teaches nor suggests having more than one working chamber in a single outer chamber. Applicant is unaware of another such basis in the art for making such a provision. Applicant respectfully maintains that Claim 2 be considered allowable as it is neither taught nor suggested in Coombe. .

Claim 18 discloses a range of frequencies over which the apparatus is operable. Coombe neither teaches nor suggests a range of frequencies relating to perturbations and Applicant is unaware of any similar basis in the prior art. Applicant respectfully maintains that Claim 18 is allowable.

Claim 29 discloses “said at least one feed inlet and said at least one discharge port are substantially mutually coaxial”. Coombe stresses (column 2 line 34 to column 3 line 41) the need to introduce solids tangentially into the vortex thereby resulting in the conservation of vortex energy. Introducing the solids tangentially in a manner to conserve the vortex energy and the pressure differential across the vortex reduces or avoids perturbations, which would otherwise reduce the vortex energy and pressure differential.

Coombe, therefore, restricts the solid feed to being generally tangentially introduced into the chamber through the peripheral side wall and not through the end wall. Specifically, solids are introduced at the peripheral side wall into the direction of rotation of the vortex flow. Since Coombe discloses only a feed inlet in the peripheral side wall, and since Applicant is unaware of a similar basis for milling in the art for vortex milling, Applicant respectfully considers Claim 29 to be allowable.

Amended Claim 59 discloses drawing feed material into the end wall of the vortex chamber by means of the vacuum created in the vortex axis without the need for a venturi or other feed propelling device. Coombe discloses in the text and in Claim 1, the provision for a

PATENT
10/080,216

venturi driven feed, generally tangentially through the peripheral side wall into the vortex chamber. Applicant is unaware of a similar basis for feeding material into the vortex milling process as stated or claimed in the art and therefore considers that Claim 59 is allowable.

The Examiner's rejection of claims 21, 28, 40 and 56 are moot as these claims have been cancelled without prejudice.

Claims 31-33, which disclose discharging partially milled material from an auxiliary discharge port for re-introduction into an auxiliary feed inlet, stand rejected over Coombe (US 4,502,641) as applied to Claim 1 of the present invention and further in view of Andrews (US 3,688,991).

The Examiner states that Coombe makes no reference to a second outlet, nor is there any reference to re-introducing partially milled solids into a second feed inlet. However, Andrews discloses a second outlet and a second venturi-type feed inlet. However, the mill disclosed by Andrews is not a vortex mill but a jet and anvil mill, comprising a high velocity jet feed system causing the feed solids to impact against a segmented high speed rotating anvil. The express purpose of reintroducing partially milled solids is to cause a secondary impact between the partially milled solids and the rotating anvil. Reference is made in Andrews (US 3,688,991), Claim 1, column 12, lines 31-37, to

"....., discharge means....for the discharge of partially ground material circulating in the apparatus, gaseous fluid injector means for accelerating said partially ground material and injecting it into high velocity impact with said rotating anvil,...."

Moreover, combining the disclosures of Coombe and Andrews destroys the concept of conserving the vortex energy as disclosed hereinabove by Coombe.

The purpose of reintroducing partially milled solids into the mill disclosed in the present application is to facilitate the milling process, which occurs in a vortex mill, namely, to cause the solids to progress through zones of varying pressures, thereby causing comminution.

Furthermore, such re-introduction of feed material into an auxiliary inlet disposed in an end wall contributes to added perturbations. Applicant is unaware of a similar basis for reintroducing material into the vortex milling process as stated or claimed in the art. Applicant maintains that

PATENT
10/080,216

Claims 31-33 are neither taught nor suggested by Coombe and Andrews when taken individually or together and therefore are allowable.

Additionally, Claims 31-33 are directly or indirectly dependent from amended Claim 1, which is allowable and therefore Claims 31-33 are considered allowable.

Claims 34-38 stand rejected as being unpatentable over Coombe (US 4502641) as applied to Claim 1 and further in view of Schurr (US 3,726,484). Coombe does not use recesses in his mill wall to aid in comminution. The Examiner alleges that Schurr solves this problem by disclosing similar apparatus including use of wall recesses.

The recesses disclosed by Schurr relate to discontinuities of the end walls, as disclosed in column 3, lines 41-46:

"The chamber 5 is shown to be relatively disc shaped, its actual dimensions being determined by the upper and lower circular plates 8 and 9 peripheral wall or rim 4, and the pair of identical upper and lower rings 11 defining opposing, concentric, symmetrical discontinuities 12."

Schurr observes in column 2 lines 40-47, that

"In accordance with my invention..... I have found that by providing paraxially symmetric discontinuities projecting from the axial walls of the chamber, there is a reduction in the radial velocity near those walls such that substantially improved classification and grinding functions are achieved."

Schurr does not disclose such discontinuities or recesses in the peripheral side wall. Specifically, the recesses disclosed in Claims 34, 35 and 38 of the present application relate to discontinuities in the peripheral side wall, thereby causing perturbations in the vortex flow. Applicant maintains that Claims 34, 35 and 38 are neither taught nor suggested by Coombe and Schurr when taken individually or together and therefore are allowable. Additionally, Claims 34, 35 and 38 are directly or indirectly dependent from amended Claim 1, which is allowable, and therefore with respect Claims 34, 35 and 38 are considered allowable.

The Examiner's rejection of claims 36-37 is moot as these claims have been cancelled without prejudice.

PATENT
10/080,216

Claim 39 and 54 stands rejected as being unpatentable over Coombe as applied to Claim 1 and further in view of Ruzicka (US 3,608,835) in view of the obviousness of Ruzicka (US 3,608,835) which discloses generating means in similar apparatus to that disclosed by Coombe. The mill disclosed by Ruzicka (US 3,608,835) is not a vortex mill but a jet and anvil mill reliant on the rotation speed of a "splitter assembly" (Column 6 lines 47-48).

With respect, Claim 54 does not relate to generating means as commented by the Examiner. Applicant maintains that the limitations of Claim 54 is neither taught nor suggested by Coombe and Ruzicka when taken individually or together and therefore is allowable. Additionally, Claim 54 is directly dependent from amended Claim 53, which is allowable, and therefore, with respect, claim 54 is considered allowable.

The Examiner's rejection of claim 39 is moot as this claim has been cancelled without prejudice.

Claim 23, 41-43, 62 and 63 stand rejected as being unpatentable over Coombe (US 4,502,641) as applied to Claim 1 and further in view of Andrews (US 4,664,319). The Examiner observes that Coombe "does not use a baffle opposite the inlet nor does he use a series of chambers" but that Andrews discloses "similar apparatus including the use of a baffle and chambers in series". The baffle disclosed by Andrews is described in Column 5 lines 39-43 as

"an anvil 76 forming a chord of the feed chamber 24 opposite the discharge end of the venturi 40 prime. In some cases it may be desirable to roughen the impact surface of the anvil 76." The purpose of the anvil disclosed in Andrews is not that of a baffle, that is, for deflecting the flow of solid particles. Rather it provides an impact anvil for primary comminution of the high velocity feed stream from the venturi. Combining the references to Coombe and Andrews in fact tends to make the combination inoperative since the mills disclosed are of different configurations in relation to feeding solid feed.

The baffle disclosed in Claim 23 of the present invention, relates to "said baffle to reduce the kinetic energy of feed particles entering said working chamber through said feed inlet, thereby to reduce feed particle velocity and thereby to diffuse particle flow into said working chamber."

PATENT
10/080,216

The baffle in the present invention does not directly cause comminution but rather provides a flow-dispersing device. Additionally, Claim 23 is directly dependent from amended Claim 1, which is allowable, and therefore the Applicant respectfully believes that this claim is allowable. With regard to Claims 41-43 and 63, Applicant is unable to find any reference in the claims or text of Andrews (US 4,664,319) or of Coombe disclosing or inferring the use of "chambers in series" as commented by the Examiner or any concept, according to the limitation of Claim 41, relating to "a plurality of working chambers arranged to facilitate flow of particulate material thereamong, in a predetermined sequence."

Therefore the Applicant respectfully maintains that claims 23, 41-43 and 63 are neither taught nor suggested by Coombe or Andrews taken individually or together and these claims are allowable.

Additionally, Claims 41-43 are directly or indirectly dependent from amended Claim 1, which is allowable, and Claim 63 is directly dependent from amended Claim 53, which is allowable and therefore, with respect Claims 41-43 and 63 are considered allowable.

The Examiner's rejection of claim 62 is moot as this claim has been cancelled without prejudice.

The Examiner has rejected claims 44-52 as being unpatentable over Coombe (US Pat No 4,502,641) as applied to claim 1 and further in view of Belavsky (US Pat No. 5,855,326). The Examiner's rejection of claims 44-52 is moot as these claims have been cancelled without prejudice.

As requested by the Examiner on page 2 of the Office Action, the Applicant reviewed the specification for obvious errors and, to the best of his knowledge, was unable to find any.

PATENT
10/080,216

In view of the foregoing amendments and comments, the application is believed to be in condition for allowance. Favorable reconsideration and allowance of the application are respectfully requested.

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